

# Sublethal Impacts of Copper on Olfaction and Olfactory-mediated Behaviors in Juvenile Coho Salmon (*Oncorhynchus kisutch*)

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## Abstract

Copper is one of the most frequently detected trace elements in surface waters from agricultural and urbanized watersheds. Here we evaluated the sublethal effects of short-term copper exposures on the olfactory neurophysiology and olfactory-mediated behaviors of juvenile coho salmon. Recordings from the olfactory epithelium (electro-olfactograms) were used to measure the inhibitory effects of copper on the responses of olfactory receptor neurons to natural odorants (amino acids, the bile salt taurocholic acid, and a conspecific skin extract). Copper reduced the responsiveness to all odorants within 20 minutes of exposure. The inhibitory effects of copper were dose-dependent and they were not influenced by water hardness. Toxicity thresholds for the different receptor pathways were determined using the benchmark dose method and found to be similar ( $\sim 6 \mu\text{g/L}$  total dissolved copper). For salmon, olfactory function underlies a wide range of behaviors that are important for survival, migration, and reproductive success. To address the impacts of copper on salmon behavior, we are currently exploring the consequences of sensory impairment for behaviors that are related to predator avoidance and juvenile survival.